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AUTHOR	Duncan, Noreen L.
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ABSTRACT

There is a common belief that people have limited mental capabilities in that they are either good at English or mathematics, but not both. There is also a myth that men are naturally good at math, while women are not. But there are many good mathematicians who also write well. Also, good students appear to be good students, regardless of the subject matter. Most people who consider themselves non-mathematicians think mathematically, without knowing that they do. One of the common themes used by teachers of English is that learning to compose helps students learn to think. In producing good written language, they can, therefore, become logical thinkers since it is not sufficient in either English or mathematics to merely reproduce patterns of formal symbols or words. There is general agreement in the academic community today that good writing and mathematical ability are produced by students not when they are drilled with rules, but when they are engaged in the processes and practices of writing and mathematics. Teachers must both excite students to learn to love learning and take risks to learn new things outside of their disciplines. (HAA)

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AN ENGLISH PROFESSOR CONSIDERS MATHEMATICS

NOREEN L. DUNCAN

Faculty Mid-Career Fellows

Princeton University

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Issues of Education at Community Colleges: Essyas by Fellows in the Mid-Career Fellowship Program at Princeton University

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AN ENGLISH PROFESSOR CONSIDERS MATHEMATICS

Just as there are very fine mathematicians who write beautifully, there must be gifted authors of prose who solve complicated proofs in mathematics, effortlessly and with elegance. Why then couldn't the creative processes invoked in the solving of complex mathematical problems be similar to those used for composing beautiful writing? I have long suspected, or maybe hoped, that there might be some magical scalpel that would dissect the common sense that good mathematicians are not born good composers of erudite and fluent essays; that facile and creative writers of English composition are unable from childhood to progress past elemental algebra.

Contemporary, anecdotal, and television intelligence would have it that there might be fundamental differences in the way people are wired so that, try as they might, some cannot be both mathematicians and writers. There is a popular mythology that American girls, women, are not good at mathematics and that boys, men, are, naturally. Hormones, environmental factors and sports interest are individually or collectively to blame for this apparent academic dissonance. Sheila Tobias in *Overcoming Math Anxiety* explores and explodes a number of the generally held reasons for women's, and some men's, apparent inability to become higher level mathematicians:

> . . . people who do well in mathematics from the beginning and people who have trouble with it have altogether different experience in learning math. These differences are not necessarily innate or cognitive or even, at the outset, differences in attitude or in appreciation for math. (Tobias 96)

A colleague and friend, a teacher of mathematics and computer science, has been somewhat intrigued and downright puzzled by this examination in which I say I'm engaged. Though quite supportive and indulgent -- he's lent me a book, *Did you Say mathematics?*-- he has patiently explained to me that one is either born a mathematician, or a writer, but that one cannot be both. He cites himself and his children as scientific and irrefutable proof: his daughter is at a young age already a beautiful writer; his son at a younger age is a mathematician. My own academic experiences and those that my students and colleagues report appear to support his contention. But there are too many good mathematicians who write elegantly to dispute his claim. I knew as a teenager that I was "good in English, but not in maths". But as an adult, a teacher of adult students who dismiss any notion that they might be "good" in more than one subject, I feel bound to reject their claims of academic handicap if I am to encourage them to be "good" at any subject at all.

I convinced myself that I was no good at maths since my early youth when Miss Daley sat in front of my high school geometry, or maybe that was algebra, class for over two years and we, her wicked and worthless girls, would gleefully write *QED* at the bottom of pages which we had filled with the most unlikely

mathematical figures and proofs and pass our books up for the class prefects to mark. As an undergraduate, I took a course called "Logic" for my mathematics requirements. I attempted physics one summer, but didn't finish it. In graduate school, I had to pass a statistics and probability course, but mathematicians tell me that statistics is not math. My current mathematical disability, or my posturing that the highly literate and literary have no need for mathematics, might be the result of those unfortunate mathematical experiences in my youth. But there were girls, even in that infamous high school class, who were very good at mathematics. My undergraduate physics professor was a woman. Being a gifted writer or a gifted mathematician is not evidence of the presence of xx or xy chromosomes.

For the most part, the adults I know, have planted themselves firmly in one or the other camp, smug in the knowledge that if one is mathematically inclined or gifted, one may be able to write error-free sentences and fairly standard prose, perhaps poetry, but one is not a "good" writer. Those who read and write literary masterpieces or just prefer to spend their leisure time with novels have no time for mathematics, which they know requires absolutely no creative thought. Unlike the mathematician, G. H. Hardy, who wrote . . . "I am interested in mathematics only as a creative art" (Hardy 115).

The narrative that I have constructed as the rationale for this bizarre foray into the realm of mathematics is that for generations English Composition students have told me that they're not good writers of the language because English is not their "good subject", mathematics is. Generally, I have not found that to be true. Good students appear to be good students, regardless of the subject matter -- at least those are not the students who challenge me and accuse me of changing the rules of the language, charging that they don't know "exactly" what "I" want from them in a composition. Whatever creative or systematic processes with which authors are engaged as they "produce" good writing must have parallels in the solution of mathematical problems. I know I don't think that the formulaic, mechanistic, fill-in-the blanks approach to basic college algebra is what I have in mind. I know that the wonderful unfolding of a problem on its way to a solution, that thing that mathematicians tell me is called a "proof" is what I have in mind.

Reading G. H. Hardy's *A Mathematician's Apology*, I have discovered beautiful writing, about mathematics. Hardy on mathematics and poetry:

> A mathematician, like a painter or a poet, is a maker of patterns. If his patterns are more permanent than theirs, it is because they are made with *ideas*. A painter makes patterns with shapes and colours, a poet with words. A painting may embody an "idea", but the idea is usually commonplace and unimportant. In poetry, ideas count for a good deal more; but as Housman insisted, the importance of ideas in poetry is habitually exaggerated: 'I cannot satisfy myself that there are any such things as poetical ideas . . . Poetry is not the thing said but a way of saying it.' . . . A mathematician, on the other hand, has no material to work with but ideas, and so his patterns are likely to last longer, since ideas wear less with time than words. (Hardy 84-85)

In the bestseller, *Godel. Escher, Bach: An Eternal Golden Braid*, Hofstadter links the "patterns" of the mathematician, Godel; the graphic artist, Escher; and the musical composer, Bach, invoking the ancient Greeks who ". . . knew that reasoning is a patterned process". (Hofstadter 19) Reasoning, arguing ones way through an intricate piece of prose. Listening for that elegant, economical, poetic word.. Composing, revising a thoughtful, thought-provoking essay. Making intricate patterns of syntax, decorated with florets of *mot justes*. As prose can be exposition and verbal representation of beauty in nature, flowers bloom in Fibonacci patterns: 3, 5, 8, 13, 21, 34 . . . Whatever I read that suggests there could be a meld of these apparently disparate ways of thinking, mathematically reasoning or linguistically fluent, confounds my thinking.

Most of us who consider ourselves non-mathematicians think mathematically, without consciousness that we do: We calculate the tip for the hairdresser; we measure for curtains and rugs; we convert pounds to ounces or millilitres to litres; we gauge how long it will take us to get to work, given certain traffic conditions and the amount of gas in the car. Many of us who teach English and write novels function so well in the mathematical world. Why aren't we then brilliant mathematicians? Why can't one be both?.

Colleague and friend B, another teacher of mathematics, explains that sometimes in the process of solving a problem with his students, he senses that he is in the middle of something beautiful. He suspects that writers in the creation of a beautiful piece of prose experience the same "rush." That is true. We, the mathematically challenged, should also be able, therefore, to feel that rush, but we have to get past the fear of arriving at the "solution, " right or wrong. Our schooling and disciplines and scholarly choices have taught us that we must have right answers at the ends of math problems. We don't worry about arriving at the correct solution as we begin writing a novel, even a mystery novel. Writers seem to enjoy the getting there, without too much concern that the outcome will be wrong, not unacceptable or disappointing or unexpected, but wrong. To enjoy and engage oneself in mathematics, then, the non-mathematician must indulge the same kind of process as in the creation of a lovely piece of prose.

Bertrand Russell in *Introduction to Mathematical Philosophy*:

> Mathematics is a study which, when we start from its most familiar portions, may be pursued in either of two opposite directions. The more familiar direction is constructive, towards gradually increasing complexity: from integers to fractions, real numbers, complex numbers; from addition and multiplication to differentiation and integration, and on to higher mathematics. The other direction, which is less familiar, proceeds, by analysing, to greater and greater abstractness and logical simplicity; . . . (Russell 1)

As a teacher of English Composition, I know that when I try to make beginning writing students recognize a kind of logical expansion of an argument

in a piece of prose, I often resort to explanations and patterning: "greater abstractness and logical simplicity." That same basketworking then, that weaving of ideas as we compose might be the same stuff of mathematics that Hardy talks about. If my composition students are to become good writers and pass college courses in which they must write, they must eventually believe, among other things, that they can express their thinking in patterns of prose recognizable to other readers and writers of the language. Part of the college English teacher's repertoire of propaganda is that learning to compose, to write essays, helps students learn to think: in ordering and producing good written language, they can, therefore, become logical thinkers -- mathematicians?

More propaganda, this time the elemental mathematics teacher's: "In order to attack a problem, first simplify it and find its essential features." "You could express the problem like this. . ." Clearly, both the teacher of composition and the teacher of math expect students to engage in a similar kind of thinking, and that has something to do with sorting, ordering, and expressing ideas in some "logical" pattern. But as any fairly good reader or writer of the language will attest, patterned language is not necessarily good language. Hofstadter reports that he once tried to develop a computer program that would generate English sentences. He spent a good deal of time "making the grammar flexible and recursive" (Hofstadter 620); he classified "each word -- noun, verb, preposition" (621); he attempted to ensure that there would be "agreement between the various parts of [a] phrase" (621) and so on. He enjoyed some

success as the program did indeed produce a number of grammatical, though not necessarily logical, sentences. His eventual sense of his creation was that "there was no sense of imagery behind what [was] said. . .the words were empty formal symbols "(623). That sense is akin to that of many elemental students of mathematics, and it reminds me of my reaction to the writings of some of my newer essay-writing students. They know that words and integers must follow each other in certain patterns, in sentences and equations, and they attempt to mimic those patterns but there is no real sense of "beauty" or "elegance" or even intelligence at work.

We, contemporary teachers of college composition, encourage our students to recognise and utilise the "rules of grammar" in the practise of writing. We no longer force students to learn rules of grammar by heart, voice, mood, parts of speech, as we did, in isolation. Be that as it may, there is general agreement in the academic writing community today that good writing is produced by students not when they are drilled with the rules and exceptions to the rules, but when they are engaged in the process and practice of writing. We believe that good prose is created as students write and voice themselves honestly. Many of us are therefore less concerned with whether adult students, college students, can recite the rules of the language as much as we are concerned with whether or not they know where to find resources to make their writing clear to intelligent readers.

I suspect that at some level that thinking is also applicable in the mathematics classroom. Students who use graphing calcuators are assumed to know how to multiply, but are surely not required to be able to recite the times tables to multiples of 14. A high level of mathematical ability and creativity no longer relies on the drilling of multiplication tables. In this way mathematics and English composition could be alike. This not to suggest that there are not fundamentals with which both the student of composition and of mathematics should be familiar. After all, our students are not "native" geniuses as the mathematician, Ramanujan, at the turn of the century, or the eighteenth century narrator, Olaudah Equiano.

What I am proposing and considering is two-fold: First, we must excite our community college students to learn to love learning, not to be be afraid of the light, to turn away from it, to be blinded by it, but to turn their faces to it and feel its warmth. In some simple way, learning new stuff must be perceived as, not just interesting, but heady. Many of us mouth the mantra -- "students must be excited about school". But we, ourselves, are not excited, are often afraid to consider anything outside of our "disciplines". That is the second part of this proposition: We must stretch ourselves even as we expect students to take the risk and learn something new. If as teachers we exhibit fear or disdain for other areas of scholarship, for new ways of acquiring knowledge, we unconsciously encourage our students to also be afraid to mentally stretch, to intellectually explore, to struggle with the new and often frightening challenges of academic

life. Many of my students don't really yet know what their "good subjects" are. Why should it be mathematics or English?

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